CLAIMS:

1. An integrated thermal imager for detecting combined passive LWIR or MWIR radiation of a scene and active SWIR radiation of a laser source, comprising a two-dimensional focal plane array (2D-FPA) constituted by an assembly of voltage tunable photodetectors,

wherein each voltage tunable photodetector integrates a quantum well infrared photodetector (QWIP) together with a heterojunction bipolar phototransistor (HBPT), thereby forming a pixel element in the 2D-FPA.

2. The imager of claim 1 wherein the QWIP includes a stack of epitaxial layers deposited on a substrate layer and the HBPT includes another stack of epitaxial layers grown on said QWIP.

3. The imager of claim 2 wherein said substrate layer is made of GaAs.

4. The imager of claim 2 wherein said substrate layer is made of InP.

5. The imager of claim 2 wherein the epitaxial layers include a first contact layer arranged underside of the QWIP layers and a second contact layer arranged at the upperside of the HBPT layers.

6. The imager of claim 5 wherein the epitaxial layers include a floating contact layer for providing a contact between said QWIP and said HBPT.

7. The imager of claim 1 wherein the HBPT includes a stack of epitaxial layers deposited on a substrate layer and the QWIP includes another stack of epitaxial layers grown on said HBPT.

8. The imager of claim 7 wherein said substrate layer is made of GaAs.

9. The imager of claim 7 wherein said substrate layer is made of InP.

10. The imager of claim 7 wherein the epitaxial layers include a first contact layer arranged underside of the HBPT layers and a second contact layer arranged at the upperside of the QWIP layers.

11. The imager of claim 10 wherein the epitaxial layers include a floating contact layer for providing a contact between said QWIP and said HBPT.

12. The imager of claim 3 wherein said QWIP includes GaAs based quantum wells and AlGaAs based barrier layers.

13. The imager of claim 4 wherein said QWIP includes $In_{0.53}Ga_{0.47}As$ quantum wells and InP based barrier layers.

14. The imager of claim 4 wherein said QWIP includes $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ quantum wells and InP based barrier layers.

15. The imager of claim 1 wherein said HBPT includes:

an emitter constituted by at least one n-type epitaxial layer;

a base arranged downstream of said emitter and constituted by at least one p-type epitaxial layer;

multiple quantum well elements arranged downstream of said base and configured for absorbing the SWIR radiation; and

a collector arranged downstream of said multiple quantum well elements and constituted by at least one n-type epitaxial layer.

16. The imager of claim 15 wherein said at least one n-type epitaxial layer of the emitter is an AlGaAs based layer.

17. The imager of claim 15 wherein said at least one n-type epitaxial layer of the emitter is an InP based layer.

18. The imager of claim 15 wherein said at least one p-type epitaxial layer of the base is a GaAs based layer.

19. The imager of claim 15 wherein said at least one p-type epitaxial layer of the base is an $In_{0.53}Ga_{0.47}As$ layer.

20. The imager of claim 15 wherein said at least one p-type epitaxial layer of the base is an $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ layer.

21. The imager of claim 15 wherein said multiple quantum well elements comprise GaAs based barrier and InGaAs based quantum wells layers.

22. The imager of claim 15 wherein said multiple quantum well elements comprise InP barrier and $In_{0.53}Ga_{0.47}As$ quantum wells layers.

23. The imager of claim 15 wherein said multiple quantum well elements comprise InP barrier and $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ quantum wells layers.

24. The imager of claim 15 wherein said at least one n-type epitaxial layer of the collector is a GaAs based layer.

25. The imager of claim 15 wherein said at least one n-type epitaxial layer of the collector is an $In_{0.53}Ga_{0.47}As$ layer.

26. The imager of claim 15 wherein said at least one n-type epitaxial layer of the collector is an $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ layer.

27. The imager of claim 15 wherein the HBPT is being operated in a floating base mode.

28. The imager of claim 1 wherein each voltage tunable photodetector is adapted to sense said active SWIR radiation by means of the HBPT, when a first predetermined bias voltage is applied across said voltage tunable photodetector, and to sense said passive LWIR or MWIR radiation by means of the QWIP, when a second predetermined bias voltage is applied across said voltage tunable photodetector.

29. The imager of claim 28 wherein said second predetermined bias voltage is higher than said first predetermined bias voltage.

30. The imager of claim 28 wherein the HBPT is being operated in a punch-through breakdown mode when said second predetermined bias voltage is applied across said voltage tunable photodetector.

31. A voltage tunable photodetector for sensing combined passive LWIR or MWIR radiation of a scene and active SWIR radiation of a laser source, comprising a quantum well infrared photodetector (QWIP) integrated together with a heterojunction bipolar phototransistor (HBPT).

32. The voltage tunable photodetector of claim 31 wherein said active SWIR radiation is sensed by means of the HBPT, when a first predetermined bias voltage is applied across said voltage tunable photodetector, and said passive LWIR or MWIR radiation is sensed by means of the QWIP, when a second predetermined bias voltage is applied across said voltage tunable photodetector.

33. The voltage tunable photodetector of claim 31 wherein the QWIP includes a stack of epitaxial layers deposited on a substrate layer and the HBPT includes another stack of epitaxial layers grown on said QWIP.

34. The voltage tunable photodetector of claim 33 wherein said substrate layer is made of GaAs.

35. The voltage tunable photodetector of claim 33 wherein said substrate layer is made of InP.

36. The voltage tunable photodetector of claim 33 wherein the epitaxial layers include a first contact layer arranged underside of the QWIP layers and a second contact layer arranged at the upperside of the HBPT layers.

37. The voltage tunable photodetector of claim 36 wherein the epitaxial layers include a floating contact layer for providing a contact between said QWIP and said HBPT.

38. The voltage tunable photodetector of claim 31 wherein the HBPT includes a stack of epitaxial layers deposited on a substrate layer and the QWIP includes another stack of epitaxial layers grown on said HBPT.

39. The voltage tunable photodetector of claim 38 wherein said substrate layer is made of GaAs.

40. The voltage tunable photodetector of claim 38 wherein said substrate layer is made of InP.

41. The voltage tunable photodetector of claim 38 wherein the epitaxial layers include a first contact layer arranged underside of the HBPT layers and a second contact layer arranged at the upperside of the QWIP layers.

42. The voltage tunable photodetector of claim 41 wherein the epitaxial layers include a floating contact layer for providing a contact between said QWIP and said HBPT.

43. The voltage tunable photodetector of claim 34 wherein said QWIP includes GaAs based quantum wells and AlGaAs based barrier layers.

44. The voltage tunable photodetector of claim 43 wherein said QWIP includes $In_{0.53}Ga_{0.47}As$ quantum wells and InP based barrier layers.

45. The voltage tunable photodetector of claim 35 wherein said QWIP includes $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ quantum wells and InP based barrier layers.

46. The voltage tunable photodetector of claim 31 wherein said HBPT includes:

an emitter constituted by at least one n-type epitaxial layer;

a base arranged downstream of said emitter and constituted by at least one p-type epitaxial layer;

multiple quantum well elements arranged downstream of said base and configured for absorbing the SWIR radiation; and

a collector arranged downstream of said multiple quantum well elements and constituted by at least one n-type epitaxial layer.

47. The voltage tunable photodetector of claim 46 wherein said at least one n-type epitaxial layer of the emitter is an AlGaAs based layer.

48. The voltage tunable photodetector of claim 46 wherein said at least one n-type epitaxial layer of the emitter is an InP based layer.

49. The voltage tunable photodetector of claim 46 wherein said at least one p-type epitaxial layer of the base is a GaAs based layer.

50. The voltage tunable photodetector of claim 49 wherein said at least one p-type epitaxial layer of the base is an $In_{0.53}Ga_{0.47}As$ layer.

51. The voltage tunable photodetector of claim 46 wherein said at least one p-type epitaxial layer of the base is an $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ layer.

52. The voltage tunable photodetector of claim 46 wherein said multiple quantum well elements comprise GaAs based barrier and InGaAs based quantum wells layers.

53. The voltage tunable photodetector of claim 46 wherein said multiple quantum well elements comprise InP barrier and $In_{0.53}Ga_{0.47}As$ quantum wells layers).

54. The voltage tunable photodetector of claim 46 wherein said multiple quantum well elements comprise InP barrier and $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ quantum wells layers.

55. The voltage tunable photodetector of claim 46 wherein said at least one n-type epitaxial layer of the collector is a GaAs based layer.

56. The voltage tunable photodetector of claim 46 wherein said at least one n-type epitaxial layer of the collector is an $In_{0.53}Ga_{0.47}As$ layer.

57. The voltage tunable photodetector of claim 46 wherein said at least one n-type epitaxial layer of the collector is an $In_{0.73}Ga_{0.27}As_{0.63}P_{0.37}$ layer.

58. The voltage tunable photodetector of claim 46 wherein the HBPT is being operated in a floating base mode.

59. A method of operating a integrated thermal imager for detecting combined passive LWIR or MWIR radiation of a scene and active SWIR radiation of a laser source, wherein said integrated thermal imager includes a two-dimensional focal plane array (2D-FPA) constituted by an assembly of voltage tunable photodetectors, wherein each voltage tunable photodetector integrates a quantum well infrared photodetector (QWIP) together with a heterojunction bipolar phototransistor (HBPT), thereby forming a pixel element in the 2D-FPA,
the method comprising:

(a) obtaining said passive LWIR or MWIR radiation along with said active SWIR radiation, and converting the radiation into photo-current;

(b) applying a first predetermined bias voltage across said voltage tunable photodetector for sensing said active SWIR radiation by means of the HBPT,

(c) applying a second predetermined bias voltage across said voltage tunable photodetector for sensing said passive LWIR or MWIR radiation by means of the QWIP; and the scene and

(d) creating an image of at least a portion of the scene and the laser source.

60. The method of claim 59 wherein said integrated thermal imager being operable in at least one imaging mode selected from a synchronized imaging mode,

a non-synchronized imaging mode, an imaging of the pure active SWIR radiation and an imaging of the pure passive LWIR or MWIR radiation.